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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/607,219	06/30/2000	Atsushi Kanda	15.18/5053	8200
24033	7590	01/12/2004	EXAMINER	
KONRAD RAYNES VICTOR & MANN, LLP 315 SOUTH BEVERLY DRIVE SUITE 210 BEVERLY HILLS, CA 90212			QUACH, TUAN N	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 01/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/607,219	KANDA, ATSUSHI	
	Examiner	Art Unit	
	Tuan Quach	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 48,49 and 52-90 is/are pending in the application.
- 4a) Of the above claim(s) 48,49,52-63 and 68-90 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 64-67 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 June 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>0703</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The response to election/restriction required filed October 20, 2003 has been received. Claims 64-67 are elected without traverse. The Information Disclosure Statement filed July 17, 2003 has also been received.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

For convenience, "et al." is omitted, e.g., Chen for Chen et al.

Claims 64-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bach taken with Chen and Hall.

Bach teaches forming dielectric layers 18 and 20 of oxide and nitride on metal line 16/17, forming photoresist 24 thereon, etching the dielectric layers to form tapered openings. The use of fluorine compound such as CF₄ or SF₆ as etchant and the inclusion of oxygen are also taught wherein such oxygen addition serves to control the tapered shape. See column 4 line 61 to column 5 line 23, column 7 line 1-3, column 8 lines 11-67. Bach does not recite the identical language of pad.

Chen teaches pad 16, passivation 20 comprising silicon oxide 20A and silicon nitride 20B, forming photoresist mask 22, dry etching the passivation 20 to the pad 16, including isotropic etching and anisotropic etching to prevent erosion of photoresist to prevent penetration and attach of passivation over wiring lines. The use of fluorine

containing etchant and fluorocarbon etchant is also taught. See the abstract, Fig. 4, column 3 line 40 to column 5 line 32.

Hall also teaches the provision of pad 22 interconnect 24 from interconnecting layer 12, which is formed from the interconnect layer followed by passivation layer 42 including oxide 422 and nitride layer 424 and the etching therethrough using dry etching including the use of suitable fluorine containing materials carbon tetrafluoride. The use of carbon tetrafluoride and oxygen is also taught. See column 2 line 7 to column 3 line 27.

It would have been obvious to one skilled in practicing Bach to have employed the metal line to be the aluminum pad since such corresponds to conventional language and structure for such aluminum structure as pad as evidenced by Chen or Hall wherein such pad application and opening thereto can be obtained. The use of isotropic etching would have been obvious and advantageous as taught by Chen wherein penetration and attack of the passivation over the wiring lines can be obviated. It would have been obvious and would have been within the purview of one skilled in the art to have employed the desired profiles including a desired angle the upper layer and a steeper angle for the lower layer if desired as evidenced in Chen, to have optimized the appropriate distance to improve device packing. Conversely, although Chen recites NF_3 as etchant of the nitride, the use of CF_4 as alternative fluorine containing materials would have been obvious to one skilled in the art as evidenced by Hall, column 3 lines 18-23, including its oxygen inclusion as delineated in Hall, column 2 line 66 and in Bach as delineated above evidencing the interchangeability of such fluorine containing

sources including the use of oxygen. It would have been conventional and obvious to have effected continuous etching given the teachings delineated above wherein no discontinuation is required or so that such discontinuation may be minimized. The completion of the connection including the provision of a bump electrode including a barrier on the exposed bonding pad is well known in the art and thus would have been obvious.

Applicant's arguments filed July 3, 2003 have been fully considered but they are not persuasive.

Applicant argues that Bach relates to vias between wiring layers and does not relate to pad structures. Applicant however has not pointed out any supporting portion wherein Bach precludes application to such pad structures. This is further refuted by a comparison between Fig. 1, structure 16, column 4 line 1-3 and the instant disclosure, Fig. 1, structure 2. Furthermore, the etching process primarily relates to that of the dual insulating layers as taught in Bach. Although Bach does not explicitly employ the "pad" language, such application would have been obvious as evidenced by Chen as delineated above, pad structure 6 wherein such structure can be passivated by dual insulating layer 20 comprising silicon oxide 20A and silicon nitride 20B, and wherein such etching can be effected by forming photoresist mask 22, dry etching the passivation 20 to the pad 16, including isotropic etching and anisotropic etching to prevent erosion of photoresist to prevent penetration and attach of passivation over wiring lines. The use of fluorine containing etchant and fluorocarbon etchant is also taught; See the abstract, Fig. 4, column 1 lines 33-35, column 3 line 40 to column 5 line

32. Such is also taught in Hall which shows the provision of pad 22 interconnect 24 from interconnecting layer 12, which is formed from the interconnect layer followed by passivation layer 42 including oxide 422 and nitride layer 424 and the etching therethrough using dry etching including the use of suitable fluorine containing materials carbon tetrafluoride. The use of carbon tetrafluoride and oxygen is also taught. See column 2 line 7 to column 3 line 27. It remains that such provision of the dual insulating layer on the pad structure would have been obvious as amply evidenced by Chen and Hall.

Applicant argues that the use of isotropical etching is not taught. Nonetheless such use is advantageous as shown in Chen, Figs. 3-4, structure 32, the abstract, column 4 line 17-37 wherein isotropic etching and anisotropic etching are advantageously employed.

Applicant further argues that one skill in the art would be motivated to form openings at right angles to the pad instead of having upper and lower with different angles. This however overlooks the teaching in Chen wherein the different angles between the lower and upper layers are evident and wherein the different angles between the lower and upper layers are shown, e.g., Fig. 4.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Quach whose telephone number is (703)308-1096 (after 1/12/04 (571)272-1717). The examiner can normally be reached on M - F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Wael Fahmy can be reached on (703) 308-4918 (after 1/12/04 (571)272-1705). The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318 (Before Final) and (703) 872-9319 (After Final).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956 (after 1/15/04 (571)272-1562).

A handwritten signature in black ink, appearing to be 'th' or similar, located at the bottom right of the page.